

## WHAT IS CLAIMED IS:

1. An apparatus for the sanitary filling of a plurality of containers with viscous liquid material, said apparatus comprising:

a sanitary pump mechanism for delivering the viscous liquid material under pressure to a viscous liquid material manifold;

a pump pulsation dampening assembly provided in series between said sanitary pump mechanism and said viscous liquid material manifold for substantially dampening an occurrence of pulsating fluid flow of the viscous liquid material, said pump pulsation dampening assembly having a sanitary cleaning mechanism that permits a cleaning-in-place operation of said pump pulsation dampening assembly; and

a plurality of sanitary fill valves for drawing the viscous liquid material from the viscous liquid material manifold and dispensing simultaneously precise metered amounts of the viscous liquid material into the plurality of containers.

2. The apparatus of claim 1, wherein said pump pulsation dampening assembly comprises a pressurized vessel having an interior surface defining a chamber for receiving the viscous liquid material from said sanitary pump mechanism.

3. The apparatus of claim 2, wherein said chamber containing a pocket of pressurized air therein for absorbing said pulsating fluid flow.

4. The apparatus of claim 3, wherein said sanitary cleaning mechanism comprises a conduit having an inlet port for receiving a volume of sanitized fluid from a sanitized fluid source and an outlet port disposed inside said chamber for dispensing a sanitized fluid therein to facilitate a cleaning-in-place operation of said interior surface of said pressurized vessel.

5. The apparatus of claim 4, wherein said outlet port comprises a nozzle head having a plurality of apertures for discharging the sanitized fluid.

6. The apparatus of claim 1, further comprising an over-pressure relief valve in communication with said chamber of said pressurized vessel for discharging air inside said chamber when the pressure inside said chamber exceeds a desired level.

7. The apparatus of claim 1, further comprising a sensing mechanism for monitoring the air-to-liquid ratio inside said chamber and an adjustment mechanism in communication with said sensing mechanism for adjusting the air-to-liquid ratio inside said chamber to a desired level in response to the duration and intensity of the pulsating viscous liquid material flow.

8. The apparatus of claim 7, wherein said sensing mechanism comprises a main body and a probe extending therefrom and into said chamber, said probe being adaptable to monitor the air-to-liquid ratio inside said chamber.

9. The apparatus of claim 8, wherein said adjustment mechanism automatically adjusts the air-to-liquid ratio in response to the duration and intensity of the pulsating viscous liquid material flow.

10. The apparatus of claim 1, further comprising a supplemental dampener and pulse rate monitor in communication with said chamber for absorbing at least a portion of said pulsating fluid flow and facilitating monitoring of the rate of pulsating fluid flow.

11. The apparatus of claim 10, wherein said supplemental dampener and pulse rate indicator is enclosed in an expandable container.

12. The apparatus of claim 11, wherein said expandable container comprises a translucent material to permit the rate of pulsation to be observed manually without the aid of tools.

13. The apparatus of claim 12, wherein said supplemental dampener and pulse rate indicator comprises at least one expandable vessel having an

interior chamber that expands and contracts in response to the pulsating action of said pump mechanism.

14. The apparatus of claim 13, wherein said expandable vessel comprises a deformable material having mechanical memory.

15. The apparatus of claim 14, wherein said deformable material comprises rubber.

16. The apparatus of claim 1, further comprising a pressure regulator in communication with said chamber to regulate the pressure therein.

17. The apparatus of claim 1, wherein said chamber is sized relative to the duration and intensity level of said pulsating output

18. A filling apparatus comprising:

a pump delivery system for delivering viscous liquid material under pressure to a viscous liquid material manifold, said sanitary pump delivery system being adaptable to also substantially dampen any pulsating output of the viscous liquid material during a filling operation; and

a plurality of fill valves for dispensing simultaneously precise quantities of the viscous liquid material into a plurality of containers, each one of said fill

valves being in communication with said viscous liquid material manifold via a fill valve station and also having a flow regulator for automatically regulating the rate of flow of the viscous liquid material from the fill valves, said automatic flow regulation being based at least upon the location of a respective one of said fill valve stations relative to said manifold to thereby permit the simultaneous dispensing of the viscous liquid material during a filling operation.

19. The apparatus of claim 18, wherein each one of said fill valves includes a valve inlet passage for receiving the viscous liquid material from said manifold, an annular valve chamber for receiving the viscous liquid material from said valve inlet passage, a valve outlet passage from which the viscous liquid material is dispensed into a respective container.

20. The apparatus of claim 19, wherein said flow regulator automatically regulates the rate of flow of the viscous liquid material by at least one of reducing and increasing the flow area into said valve chamber.

21. The apparatus of claim 20, wherein each one of said fill valves comprises an ON/OFF positive controlled viscous liquid material dispenser for dispensing the viscous liquid material from said valve chamber.

22. The apparatus of claim 21, wherein said material dispenser comprises a piston cylinder.

23. The apparatus of claim 22, wherein said piston cylinder includes a main piston body and a piston head disposed at a distal end thereof for dispensing the viscous liquid material from said valve chamber.

24. The apparatus of claim 23, wherein an annular surface of said valve housing has a tapered wall adjacent said valve outlet passage that forms a seat for said main piston body.

25. The apparatus of claim 24, further comprising a seal mechanism for positively sealing said piston cylinder in said valve chamber.

26. The apparatus of claim 25, wherein said seal mechanism comprises a first seal member disposed on said piston head for cleaning-in-place said outlet passage to prevent dripping of the viscous flowable material during a dispensing cycle, a second seal member disposed intermediate said main piston body and said piston head for positively shutting off flow of the viscous liquid material during a dispensing cycle and a third seal member disposed adjacent said main piston body for preventing fluid leakage at a basal end thereof.

27. The apparatus of claim 26, further comprising a drive mechanism for actuating said piston cylinder.

28. The apparatus of claim 27, wherein said drive mechanism comprises a pneumatic cylinder.

29. The apparatus of claim 20, wherein said viscous liquid material flow regulator comprises a regulator body and a regulator adjustment mechanism for selectively displacing said regulator body within said valve housing between a downward position decreasing the flow area into said valve chamber and an upward position increasing the flow area into said valve chamber.

30. The apparatus of claim 29, wherein said regulator adjustment mechanism comprises a threaded screw and an adjustment nut, said threaded screw having a lower end connected to an upper portion of said regulator body and an upper end connected to said adjustment nut, wherein rotation of said adjustment nut and said threaded screw causes to displace said regulator body.

31. The apparatus of claim 29, wherein said regulator adjustment mechanism comprises an electric actuator.

32. An apparatus adapted for use in a sanitary filling operation for the simultaneous metered filling of precise quantities of viscous liquid material into a plurality of containers, said apparatus comprising:

(a) a double action pump mechanism for delivering the viscous liquid material to a viscous liquid material manifold, said sanitary pump mechanism including a housing sized to receive a piston cylinder having a positively-controlled piston head for reciprocating movement therein, said housing having a pair of inlet ports and a pair of outlet ports disposed, each one of said inlet ports and said outlet ports having a check valve removably and sealingly disposed therein for substantially reducing turbulence and cavitation during a filling operation;

(b) a pump pulsation dampening mechanism for substantially dampening an occurrence of pulsating fluid flow generating by said pump mechanism; and

(c) a plurality of fill valves for simultaneously dispensing a precise metered amount of the viscous liquid material into the containers.

33. The apparatus of claim 32, wherein said pump mechanism further comprises a compression seal including an O-ring seal with a flat face.



34. The apparatus of claim 33, wherein said compression seal further comprises a compression nut threaded to one of said removeably sealable ends for compressing said O-ring seal.

35. The apparatus of claim 34, wherein said compression seal includes a pair of O-ring seals with flat faces are wiper seals and a compression washer disposed intermediate between said pair of O-ring seals a bushing disposed between one of said O-ring seals and said compression nut.

36. The apparatus of claim 32, wherein said check valve is a sanitary check valve.

37. The apparatus of claim 32, wherein said check valve has a valve stem guide and a valve seat guide.

38. The apparatus of claim 36, wherein said sanitary check valve includes a separate separable check valve housing disposed in said inlet ports and said outlet ports.

39. The apparatus of claim 38, wherein said separable check valve housing includes a valve seat and a valve guide having means for controlling the radial motion of the check valve.

40. The sanitary pump of claim 39, wherein said check valve includes a stem portion terminating in a conical shaped base for receiving a spring and said check valve housing includes a valve stem guide having a cavity for receiving said spring and limiting the radial motion of said check valve in operation.

41. The apparatus of claim 40, wherein said valve stem guide includes a collar for receiving said stem and limiting the radial motion of said check valve in operation.

42. The apparatus of claim 40, wherein said check valve includes an O-ring seal and a valve seat guide for fitting within said valve seat of said housing for limiting the radial motion of said check valve in operation.

43. The apparatus of claim 40, wherein said separable check valve housing includes flanges for interconnecting said separable check valve housing.

44. The apparatus of claim 32, wherein said removeably sealable ends are interchangeable.

45. The apparatus of claim 44, wherein both of said removeably sealable ends include a compression seal for said removeable piston drive shaft.

46. The apparatus of claim 32, wherein said piston drive shaft includes means for adjusting the length of said piston head stroke in said cylinder housing.

47. The apparatus of claim 32, wherein said inlet ports and said outlet ports are disposed in said housing.

48. The apparatus of claim 32, wherein said inlet ports and said outlet ports are disposed on said removeably sealable ends.

49. The apparatus of claim 32, wherein said inlet ports are disposed on said removeably sealable ends and said outlet ports are disposed in said housing.

50. The apparatus of claim 32, wherein said removeably sealable ends are interchangeable and are removably connected to said housing.

51. The apparatus of claim 32, further comprising a drive mechanism for driving said piston cylinder.